



The EBS30 is a base station meant to serve Opticon's electronic shelf labels via two built-in 802.15.4 based radios.

## Specifications Manual

All information subject to change without notice.

## Document History

<b>Model Number:</b>	EBS30	<b>Specification Number:</b>	
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## Limited Warranty and Disclaimers

### PLEASE READ THIS MANUAL CAREFULLY BEFORE INSTALLING OR USING THE PRODUCT.

## Serial Number

A serial number appears on all Opticon products. This official registration number is directly related to the device purchased. Do not remove the serial number from your Opticon device. Removing the serial number voids the warranty.

## Warranty

Unless otherwise agreed in a written contract, all Opticon products are warranted against defects in materials and workmanship for two years after purchase. Opticon will repair or, at its option, replace products that are defective in materials or workmanship with proper use during the warranty period. Opticon is not liable for damages caused by modifications made by a customer. In such cases, standard repair charges will apply. If a product is returned under warranty and no defect is found, standard repair charges will apply. Opticon assumes no liability for any direct, indirect, consequential or incidental damages arising out of use or inability to use both the hardware and software, even if Opticon has been informed about the possibility of such damages.

## Packaging

The packing materials are recyclable. We recommend that you save all packing material to use should you need to transport your scanner or send it for service. Damage caused by improper packaging during shipment is not covered by the warranty.

## Trademarks

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## 1. Abstract

This manual provides specifications for the EBS30 base station that can serve Opticon's electronic shelf labels. (hereafter referred to as "Base Station").

## 2. Overview

The EBS30 is a base station, equipped with two 2.4GHz radios for data communication with Opticon's electronic shelf labels. This product uses Direct Sequence Spread Spectrum RF technology that allows for an ultra-low power consumption combined with a reduced sensitivity to background noise. That means less interference by other radios that operate in the 2.4GHz band. The radio protocol that is used is based on the IEEE 802.15.4 standard that specifies the physical layer and media access control for low-rate wireless personal area networks.

The base station provides the link between a back office system and the ESLs. The base station is equipped with an Ethernet interface so that it can connect to a local area network. It has a two port Ethernet switch built-in that allows for easy daisy chaining, enabling simplified network cabling.

### 3. Physical Features

#### 3.1. Dimensions

W 145.1 x H 110.1 x D 32.4 mm (without antennas)

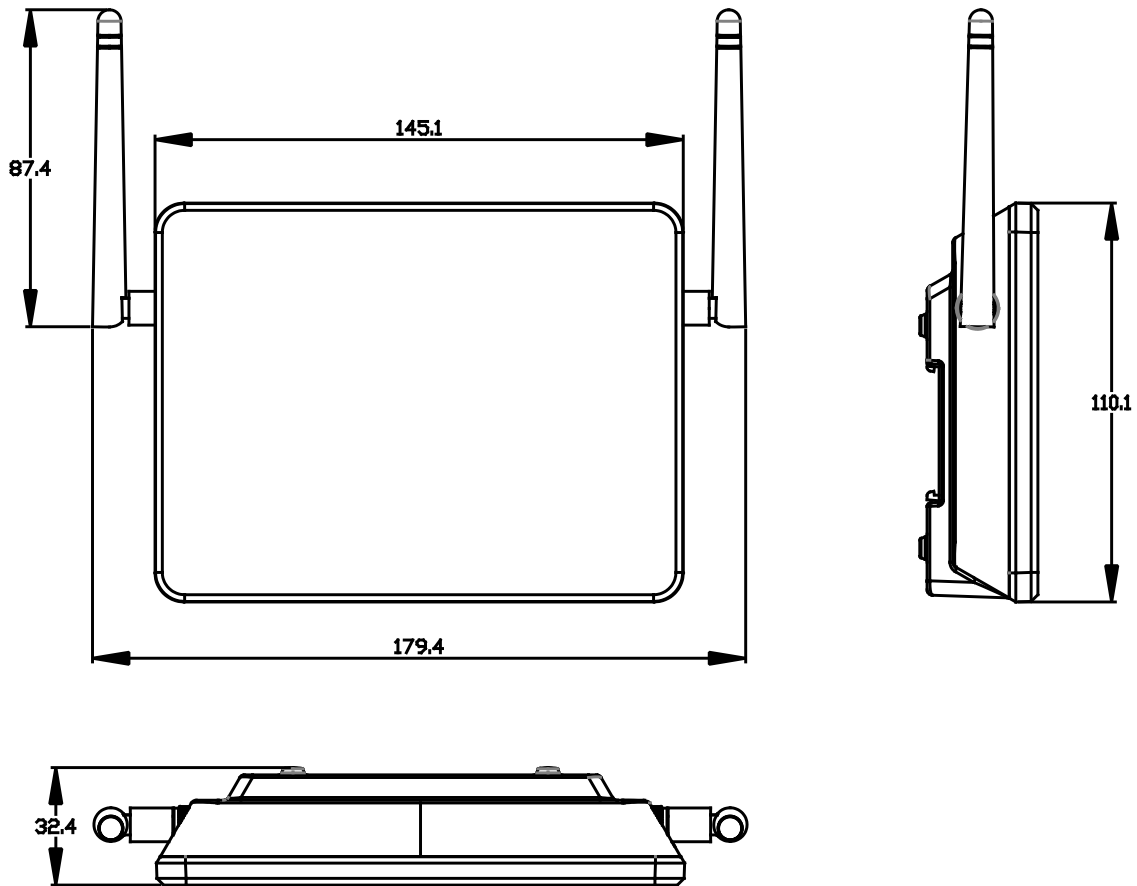


Figure 1: Dimensions

#### 3.2. Weight

250 g (including antennas)

## 4. Environmental Specifications

### 4.1. Operating Temperature and Humidity

Temperature: -10 to 50° C

Humidity: 20% to 85% RH

### 4.2. Storage Temperature and Humidity

Temperature: -20 to 60° C

Humidity: 20% to 85% RH

### 4.3. Static Electricity

Air discharge:                   ± 8 kV MAX (No malfunction)  
  ± 15 kV MAX (No destruction)

Contact discharge:           ± 4 kV MAX (No malfunction)  
  ± 8 kV MAX (No destruction)

### 4.4. Drop resistance.

There will be no sign of decreased performance after the following drop test:

Drop the EBS30 from 1.8 M above the concrete floor (6 sides, 3 times each).

Scratches or discoloration of the casing do not decrease product performance.

### 4.5. Dust and Drip Proof

This product will not have an IP rating. The intended use is indoor only.

## 5. Controls

Items	Specifications		Remarks
CPU	Type	Cortex M3 32-bit MCU	
	Internal flash ROM	256 Kbyte	
	Internal RAM	96 Kbyte	
	External RAM	8 MByte	
	Clock frequency	80 MHz	
Ethernet Interface	Speed	10 Mbit/sec & 100 Mbit/s	
	Operation mode	Half duplex & Full duplex	
	Nr of ports	2	
Radio	Modulation	DSSS	
	Frequency	2394 ~ 2507 MHz	Globally approved 2.4GHz band.
	Baud rate	250 Kbits / second	

## 6. Electrical Specifications

### 6.1. Electrical Characteristics

Parameter	Min	Typ	Max	Remarks
Operating voltage	4.5 V		6.6 V	
Operating current		400 mA		Both Ethernet ports connected. Operating voltage 5V
Input current		2.0 A		



## 7. Radio Specifications

Parameter	Min	Typ	Max	Unit	Remarks
Receiver sensitivity		-97	-89	dBm	Over the entire temp. and operating voltage range
Nominal output power	-3	4.5	7	dBm	
Frequency	2394		2507	MHz	Over the entire temp. and operating voltage range
Transfer rate		250Kbit/s			
RSSI range		100		dB	Signal strength indication that can be reported to the base station

### 7.1. Protocol

Modified 802.15.4 (Physical layer and Media Access Control layer).

#### 7.1.1. The physical layer

The physical layer (PHY) provides the data transmission service, as well as the interface to the physical layer management entity, which offers access to every layer management function and maintains a database of information on related personal area networks. Thus, the PHY manages the physical RF transceiver and performs channel selection and energy and signal management functions. It operates on the above mentioned frequency band. The PHY layer is 100% compliant and is based on direct sequence spread spectrum (DSSS) technique with a transfer rate of 250 kbit/s.

#### 7.1.2. The medium access control layer

The medium access control (MAC) layer enables the transmission of MAC frames through the use of the physical channel. Besides the data service, it offers a management interface and itself manages access to the physical channel. It also controls frame validation, guarantees time slots and handles node associations. Finally, it offers hook points for secure services. The EE200 does not make use of the optional network beaconing, instead it used a polling mechanism to increase power efficiency. Some changes are made to the standard to allow for more efficient data frames and better power efficiency, especially when nodes are not connected to a base station.

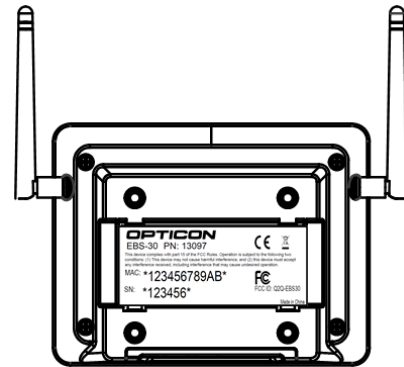
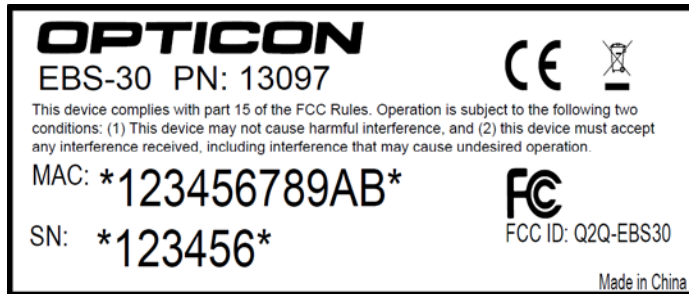
### 7.2. Security

The 802.15.4 standard 128-bit AES encryption is supported. A secure method for key management is implemented as well. The encryption is optional though and can be configured. By default the radio traffic is unencrypted.

## 8. Labeling

### 8.1. Product label

The product label shown below is affixed to the back side of the base station.



The

Figure 2: product label

label shows two barcodes; on top is the Ethernet MAC address and below is the serial number of the base station. The MAC address shown here matches the actual address programmed into the EBS30.

The addresses for the two 802.15.4 radios are derived from this address. These addresses (both are the same) are essentially the same as the Ethernet address, but with two zero's. Below is a description of those addresses:

Ethernet MAC address:  $M_1M_2M_3-S_1S_2S_3$

802.15.4 MAC address:  $M_1M_2M_3-S_aS_bS_1S_2S_3$

$M_1M_2M_3$  Define the manufacturer ID, which is 00126A in our case and is the same for both address types. The bytes following that define the product number and that number is 3 bytes long for an Ethernet address and 5 bytes for a 802.15.4 address. To convert the two, we have set  $S_aS_b$  both to zero. So e.g. an Ethernet MAC address of 00126A45AB23 results in an 802.15.4 address of 00126A000045AB23

Material: Base + laminate protection against wear.

Base: PP film, thickness 80µm, backing with glue.

Laminate: PET film, clear, thickness 50µm.

Colors: Black & White

The dimensions of the product label are W 84 x H 35.

## 8.2. White box label

The white box label is made from plain paper and is meant to show the product number and serial number. The label design is shown below.



Figure 3: shipment box label

The Size is 70mm x 40mm with a tolerance of  $\pm 2$  mm

Label material: Paper, white, with permanent adhesive backing.

Article number: Standard code 39 + human readable text , data = TBD

Serial number: Standard code 39 + human readable text, data should match that of the product inside the box.

## 9. Packaging Specifications

### 9.1. Individual Packaging Specification

After putting a scanner in a foam bag, pack it in a separate box with the accessories:

- Two antennas
- One quick start guide

Put a label on the side of the individual packing box.

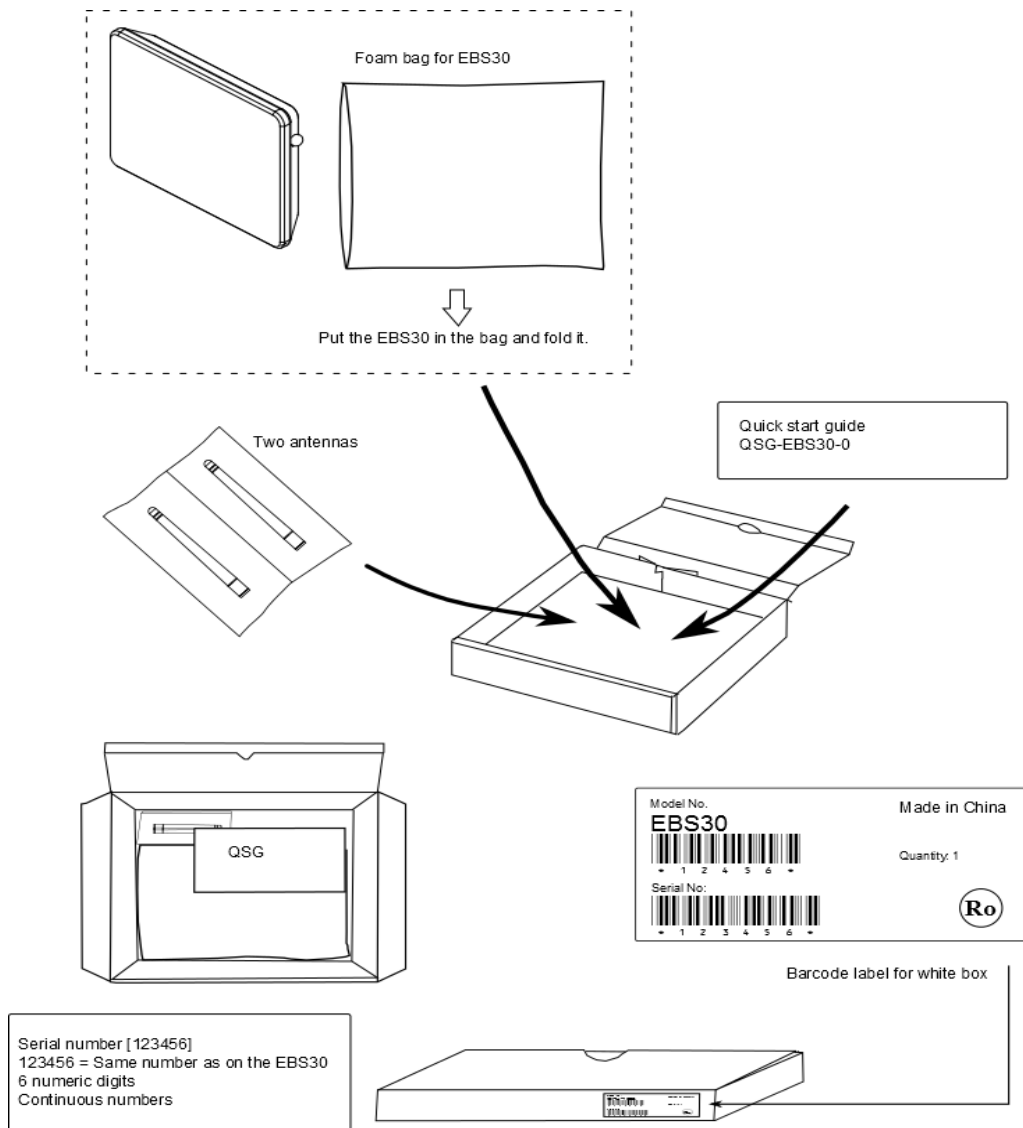
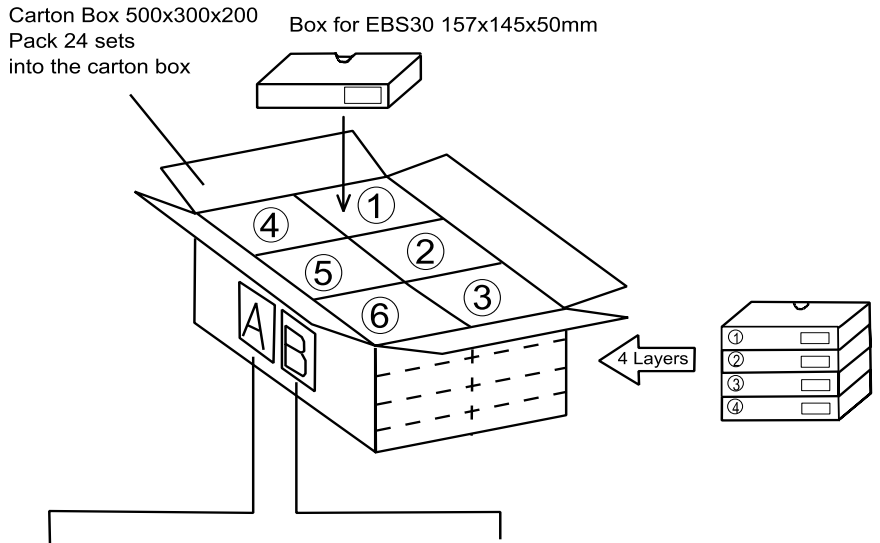


Figure 4: Individual Packing

### 9.2. Collective Packaging Specification

Put 24 individual boxes with a base station inside a box.



A: Barcode serial label for packing box  
Stick the labels on both front and back side of the box

B: Missing serial number label  
Attach this label when more than two serial numbers are out of sequence.

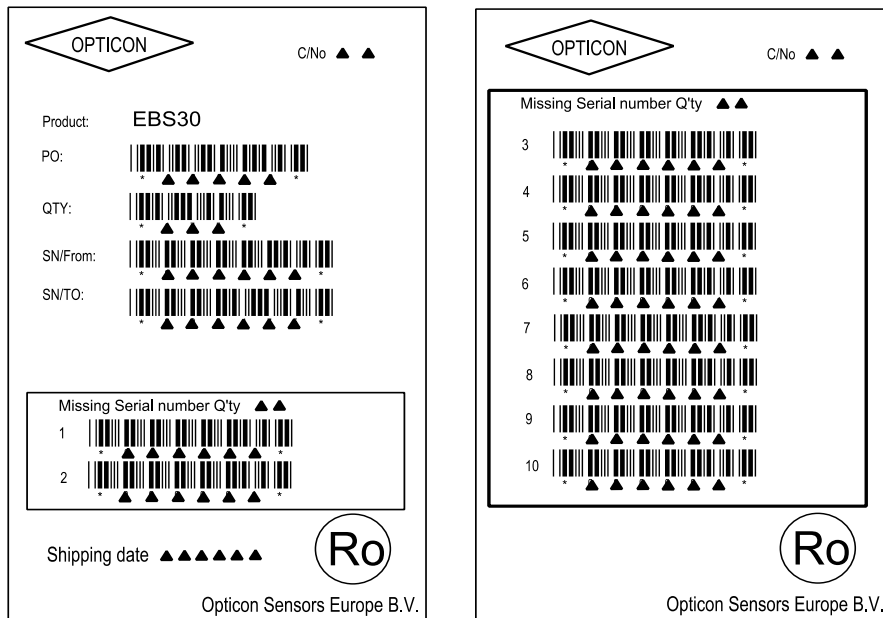


Figure 5: Collective packaging

**Note:** The “RO” mark labeled on the package tray or package box guarantees that the applicable product has passed our test of RoHS restrictions compliance (the restriction of the use of certain hazardous substances in electrical and electronic equipment, 2002/95 EC). However, this document does **not** have any legal weight in the European Union.

## 10. Accessories

To mount the base station to e.g. a wall or onto the ceiling, a standard DIN rail can be used. This is a standard product and can be purchased through Opticon but is also commonly available in the market.

The DIN rail that fits the EBS30 is 35mm wide and 7.5mm high and is available in many different lengths. The minimum length for the EBS30 is 100mm.

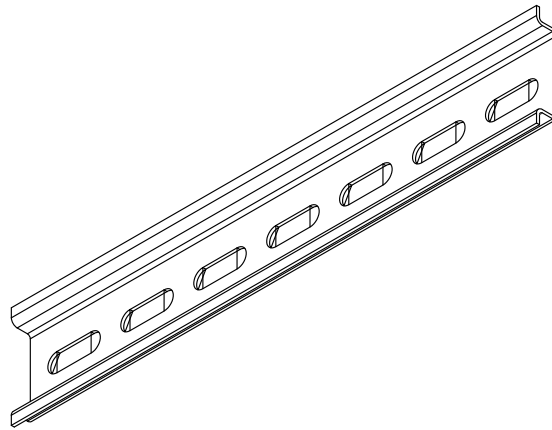


Figure 6: DIN rail to mount the EBS30.

## 11. Regulatory Compliance

### 11.1. Product Safety

EN60950-1:2001

IEC60950-1:2001

### 11.2. EMC

EN55022

EN55024

FCC Part 15 Subpart B Class B

This device complies with part 15 of the FCC Rules.  
Operation is subject to the following two conditions:  
( 1 ) this device may not cause harmful interference, and  
( 2 ) this device must accept any interference received, including interference that may cause undesired operation.

FCC Part 15 Subpart C Clause 247 (Spread spectrum radio systems)

#### **Federal Communications Commission (FCC) Statement**

15.21

You are cautioned that changes or modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment.

15.105(b)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- 1) this device may not cause interference and

2) this device must accept any interference, including interference that may cause undesired operation of the device.

**RF Radiation Exposure Statement:**

1. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
2. This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

### 11.3. RoHS

RoHS: The restriction of the use of certain hazardous substances in electrical and electronic equipment, 2002/95 EC.



## 12. Safety

Handle this product carefully. Do not deliberately subject it to any of the following.

### 12.1. Shock

Do not throw or drop the base station.

Do not place heavy objects on the base station.

### 12.2. Temperature Conditions

Do not use the base station at temperatures outside the specified range.

Do not pour boiling water on the base station.

Do not throw the base station into the fire.

Do not leave the base station on the dashboard of a car.

### 12.3. Foreign Materials

Do not immerse the base station in liquids.

Do not subject the base station to chemicals.

### 12.4. Other

Do not disassemble this product.

The base station may be damaged by high voltage discharges.

### 13. Mechanical Drawing

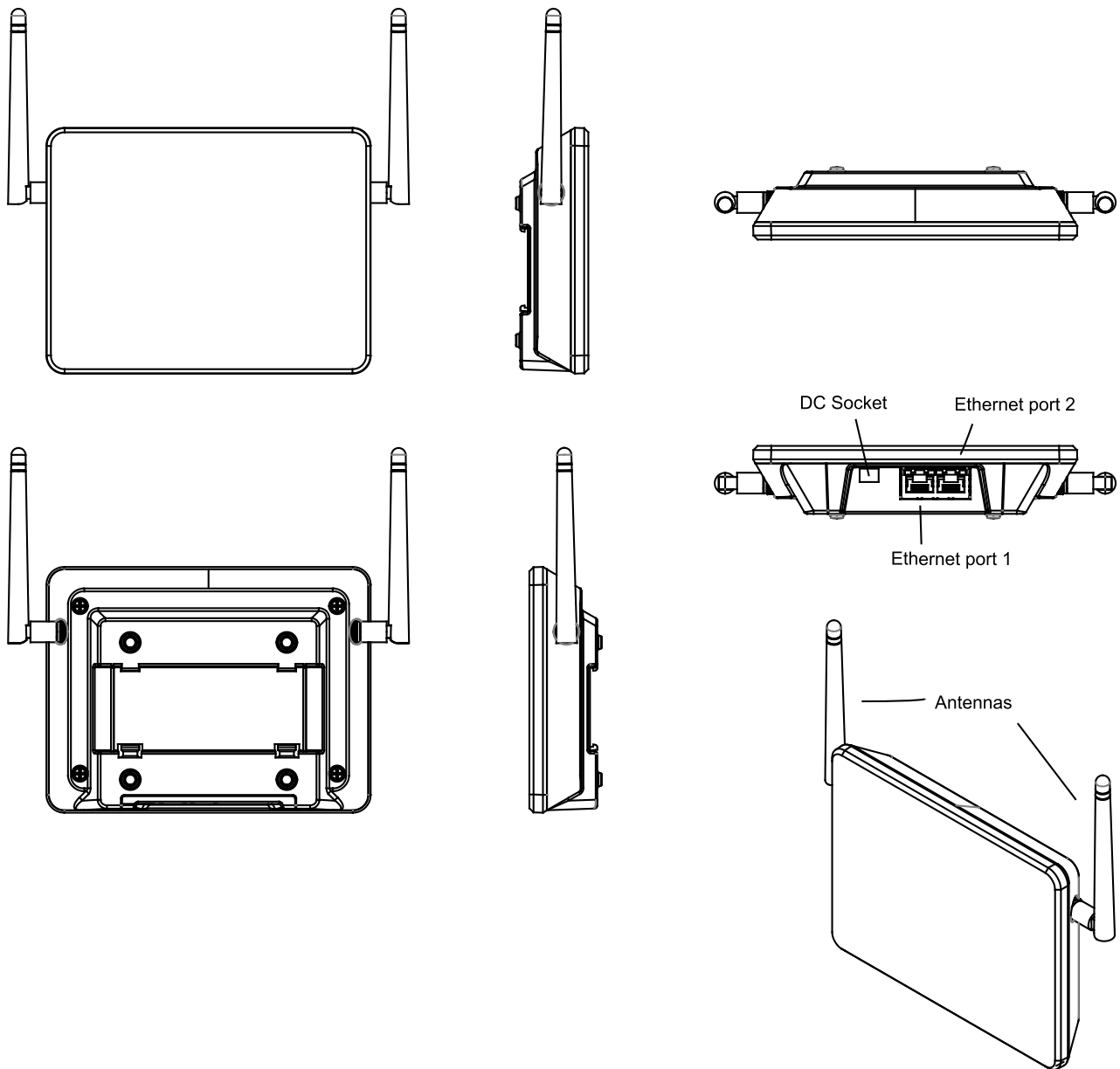


Figure 7: Mechanical drawing